liverworts, lichens, algæ and fungi. Collections are required in each group, thus insuring a practical acquaintance with the plants in their native habitats.——In the first annual report of the Wisconsin Agricultural Experiment Station, Professor Trelease gives accurate popular descriptions of the onion mold (*Peronospora schleideniana* D. By.) and the apple scab and leaf blight (*Fusicladium dendriticum* Wallroth). Both articles are illustrated by wood-cuts, which add materially to their value. Work of this kind is, in our opinion, much more valuable than that which usually fills the reports of these stations. We wish we could see more papers like Professor Trelease's. May we not commend to the directors of agricultural stations the remark of the editor of *Science* in a recent number of that journal, in discussing the proper aim and scope of such stations: "The great need of agriculture to-day is not new varieties of plants or improved breeds of animals, new methods of cultivating the soil or improved systems of farming; all these, and many other like things, are good; but the two great wants are a better knowledge of principles and greater intelligence to apply them."——Dr. B. D. Halsted, of New York, has been elected to the chair of botany in the Iowa Agricultural College.——The December *Journal of Botany* contains a fine photograph of the late George Bentham.——We see it announced in English journals that translations of De Candolle's Origin of Cultivated Plants, and De Bary's Anatomy of the Vegetative Organs of the Phanerogams and Ferns have recently been brought out, the former by C. Keagan Paul, London, and the latter by the Clarendon Press, Oxford. ——De Bary's "Vergleichende Morphologie und Biologie der Pilze, Mycetozoen und Bacterien has just reached us, but too late for further notice at this time. It is a stout volume of 558 octavo pages and is illustrated with 198 wood-cuts. This work merits an early translation.——*The Journal of Mycology*, by J. B. Ellis and W. A. Kellerman is announced to appear soon.

ENTOMOLOGY.

EMBRYOLOGY OF APHIDES.[1]—Witlaczil corrects many misconceptions and adds largely to our knowledge of insect embryology. His researches were chiefly on the viviparous females. The oviparous females and the males appear late in season, and have much the same course of development as is here described. The winter-eggs are specially characterized by a large amount of yolk.

1. *The Egg*.—The egg has a peripheral part consisting of clear protoplasm, and a central part consisting chiefly of granulated yolk. The germinal vesicle with nucleus is in the central part, and is capable of amœboid movements. The anterior and poste-

[1] By Dr. Emanuel Witlaczil, of Vienna (Zeitschrift f. Wiss. Zool., Bd. XL, 1884, p. 559–696, and taf. XXVIII–XXXIV).

rior poles of the egg are determined by its position in the ovarian tubule, in which it remains during its whole course of development.

2. *Segmentation and formation of Blastoderm.*—The segmentation instead of being superficial, as usually described, is *endovitelline.* The germinal sac dissolves, and its nucleus divides repeatedly, forming a large number of nuclei within the yolk. The nuclei have amœboid movements, and go towards the posterior pole (*PP*),[1] and thence spread over the surface-protoplasm. A few of the nuclei remain in the center; but the great majority become distributed over the surface, where each forms a center of attraction for the protoplasm. Thus a layer of cells is formed over the whole surface, the cells being smaller and more numerous towards the posterior pole, which is most active in its rate of development (Fig. 1). This layer is the blastoderm. A few cells are subsequently formed by the nuclei remaining in the center, but the protoplasm in the center being scanty, the rate of development is retarded or partially suppressed.

This mode of development is a kind of gastrulation, showing a transition to epiboly, in which the peripheric protoplasm would be confined to the spot over the germinal sac. The largeness of the egg and the distribution of protoplasm all over the surface, cause the difference. The few cells formed in the center represent the endoderm.

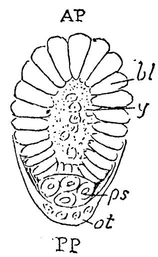

Fig. 1.

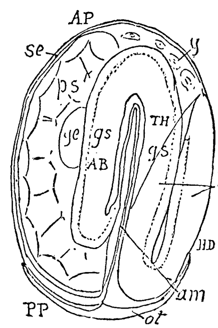

Fig. 2.

FIG. 1.—Ovum with blastoderm completed and pseudovitellus beginning to invaginate. FIG. 2.—Germ-streak, lateral plates and amnion are completed; yolk becoming exhausted; pseudovitellus enclosing genital layer and part of germ-streak. The dotted line indicates the commencing mesoblast.

3. *Peculiar to Aphides.*—Cells from the epithelium of the ovarian tube form an appendage to the posterior pole of the egg. A single cell is given off from these, which repeatedly divides so as to become a cell-mass. These increase by absorbing food, and afterwards became invaginated as a greenish mass, called *pseudovitellus* (*ps*). This is destined to be received dorsally into the embryo and to become paired masses in the abdomen. The

[1] Explanation of reference letters in the figures; *AB*, abdomen; *AP*, anterior pole; *HD*, head; *PP*, posterior pole; *TH*, thorax; *am*, amnion; *at*, antennæ; *bl*, blastoderm; *br*, brain; *ec*, ectoderm; *ge*, generative cells; *gs*, germ-streak; *lp*, lateral plate; *md*, mandible; mx^1 mx^2, first and second maxillæ; *ot*, ovarian tube-cells; p^1 p^2 p^3, first, second and third thoracic limbs; *pc*, procephalic part; *prc*, proctodæum; *ps*, pseudovitellus; *se*, serous layer; *sg*, salivary glands; *st*, stomodæum; *y*, yolk.

inside of the ovarian-tube cells (*ot*) remain as an appendage to the posterior pole of the egg.

4. *Formation of Germ-streak.*—Energetic cell multiplication at the posterior pole causes a new invagination at that place (Fig. 2). One side of the invaginated part is of thick cells, this is the *germ-streak* (*gs*) (ventral plate of Balfour), and ultimately the embryo; the other side of the invaginated part is of thin cells, this becomes the amnion (*am*). The blastoderm remains thin, except where it adjoins the outer extremity of the germ-streak, where it is thickened so as to form lateral plates (*lp*). Thus embryo and amnion are both buried in the center of the egg; the embryo bends ventrally, the abdomen curving round so as to approximate to the posterior pole, and to have appendages and amnion within its bend. The head end is at the place of invagination, lateral plates coöperating with the extremity of the germ-streak towards the formation of head and brain.

The central position of the embryo is characteristic of the lower orders of insects, which are therefore termed *entoblastic.* These include Hemiptera, Orthoptera and probably Thysanura. The higher orders, as Hymenoptera, Lepidoptera, Coleoptera, Diptera and perhaps Neuroptera, are *ectoblastic*, having a ventral plate formed on the surface, afterwards sinking slightly under the blastoderm, and having the anterior pole of the egg the more active. The ectoblastic condition seems to be a case of anticipation of changes which must afterwards be encountered by the inferior forms (see section 14 below).

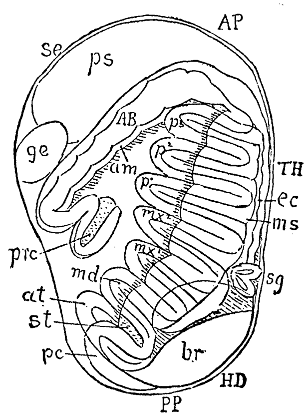

FIG. 3.—Embryo with appendages formed, before its revolution in the egg.

5. The blastoderm being now thin becomes the *serous tunic* around the whole egg.

6. *Genital Cells.*—A few large cells arise at an early stage inside the blastoderm, near the place of invagination (*ge*). These come to be ultimately received into the embryo along with the pseudo-vitellus, and become paired generative organs, groups of ovarian tubules.

7. *Germinal Layers.*—The germ-streak divides into an outer and an inner layer, each cell dividing into an outer and inner part. Thus are formed *ectoderm* and *mesoderm* (*ec*, *ms* in Fig. 3; also indicated by the dotted line in Fig. 2). The few cells formed in the center of the egg are the only representatives of endoderm. (In ectoblastic insects the mesoblast is formed by an infolding of ectoderm.)

8. The *appendages* next show themselves, those of the head

arising first; and the body becomes segmented, the head having three (afterwards four) segments; the thorax three and the abdomen seven or eight (afterwards ten, including the telson). Thus seventeen would be the maximum number of somites of the insects.

9. *Alimentary Canal.*—An invagination for the mouth is seen (*stomodæum, st*), and subsequently another for the anus and intestine (*proctodæum, prc*). These meet each other in the body so as to complete the alimentary canal. The stomodæum forms œsophagus and stomach; proctodæum forms intestine and rectum. The mid-intestine is not chitinized, but this is related to its function and has no embryological significancy.

The true endoderm becomes yolk-balls, afterwards wandering cells, subserving nutrition, but not directly aiding in the formation of the alimentary canal or of any other organ. The author excludes the endoderm from any share in forming the intestine in all Arthropods, if not more widely.

10. The *appendages* now shew their special characters. They arise by an evagination of the body wall, including ectoderm, mesoderm and part of the body cavity. Thus arise the mandibles and two pairs of maxillæ in the head; these keep small as compared with the limbs; the mandibles and first maxillæ afterwards combine to form a retort-like mass. The antennæ arise beside the stomodæum, in the same way as the other appendages (not from the procephalic part). The abdominal segments bear minute projections, probably rudimentary limbs.

11. The *procephalic part* is not originally lobed in Aphides; it arises as an extension forwards of the antennal segment. It subsequently becomes pointed and forms the labrum.

12. The *ventral nerve-cord* arises from the ectoderm, its cells dividing so as to leave only a thin dermal layer. Transverse segmentation causes it to be marked off into ganglia (three anal, three thoracic, seven abdominal, which are small). These subsequently coalesce into a subœsophageal and ventral mass.

The *brain* is formed in the region of the lateral plates, but its primitive relation to the ventral cord was not made out.

13. *Body-cavity.*—The general body-cavity represents the original segmentation-cavity. In an early stage free polar-cavities are formed between blastoderm and yolk, thus corresponding to the segmentation-cavity of lower animals. These cavities uniting insert themselves between the yolk and germ-streak, and extend into the embryo and its appendages. The same cavity spreads under the serous layer as a separate cavity. In the early stages the embryo is open dorsally, and by this route the pseudo-vitellus and generative mass find admission to its interior. Between the embryo and amnion is an "embryonal cavity" derived from the lumen of the ovarian tube.

14. *Revolution of Embryo.*—When the parts of the body and

the appendages are well formed (after the stage indicated in Fig. 3) the whole embryo changes its position in the egg, so as to approach the original attitude of the ectoblastic embryos. The abdomen is shifted away from its proximity to the head and thorax. The head moves to the anterior pole; the abdomen to the posterior pole; the curvature of the embryo becomes changed so as to invert the relation of dorsal and ventral aspects.

15. *Tracheæ.*—Seven pairs of minute invaginations appear on the sides of the abdomen, and afterwards two pairs in the thorax (sometimes a third in the thorax and an eighth in the abdomen, giving a maximum of eleven pairs). These are the entrances of the tracheæ whose inner extremities are afterwards united by longitudinal tracheæ. The salivary ducts from the third postoral segment to the salivary glands (*sg*) arise in a similar way, and seem to be homologous with tracheæ.

16. The *heart* is formed as a solid cylinder of mesoblast in the dorsal region. It afterwards becomes hollow, the central cells probably becoming blood corpuscles; is constricted at intervals and obtains alary muscles and valves.

17. *Cornicula.*—The "sugar-tubes," or cornicula, have no sugar or honey, but urates, which are discharged from secreting cells within. They arise as thickenings of the abdominal walls. It is not the honey but the excrement of Aphides that ants seek after. There are no malpighian vessels in Aphis, their function being perhaps vicariously discharged by the cornicula.

18. The wings arise by evaginations of the dermis, the two plates curving to flatten themselves.

19. The following developmental periods appear to be generally applicable to insects:

(1) Preparatory to organ-budding: as segmentation, gastrulation, formation of blastoderm, of germ-streak, and of embryonal skin.
(2) Organ-budding.
(3) Growth of these organs, and appearance of some new ones before hatching.
(4) Post-embryonic development of larva; now the generative organs reach full development.—*G. Macloskie.*

NERVE-TERMINATIONS ON ANTENNÆ OF CHILOGNATH MYRIOPODS.—A preliminary note upon these structures is contributed by O. Bütschli; the results were worked out by Dr. B. Saupine in conjunction with Dr. Bütschli, but having been left in an incomplete condition, a brief *résumé* of the more important new facts seemed desirable.

Previous observers have noted the occurrence of conspicuous structures upon the antennæ of Chilognatha, which correspond to the so-called olfactory cylinders of insects recently studied in detail by Hauser, and between the two there seems to be a general similarity.

Each of the sensory processes is entered by a nerve which immediately divides into two branches, each covered with ganglionic cells which are distributed in two groups, the anterior one consisting of considerably smaller cells than the posterior ones; at the distal extremity the nerve-fibres again collect into a bundle and form the termination of the organ; that these fibers are differently constituted from those which enter the ganglion from above is shown by the fact that their behavior to staining reagents is different; the sensory process is often at the free extremity so that a direct communication is established between these nerve-endings and the outer world.

A structure essentially similar to this is found in Vespa, but is differently construed by Hauser; according to him the posterior group of cells is not present, since he only figures one nucleus *with several nucleoli*, however, while the anterior group of smaller cells has escaped his attention; accordingly the conclusion to which Hauser has arrived at is that the whole sensory structure is a single cell; whereas in reality it consists of a great number of cells.—*Journ. R. Micr. Soc., August, 1884.*

POISON APPARATUS AND POISON OF SCORPIONS.—J. Joyeux-Laffuie, from his own studies and a consideration of what has been discovered by other naturalists, comes to the conclusion that the poison organ of the scorpion (*L. occitanus*) is formed by the sixth or last somite of the post-abdomen, which terminates by a sharp process, at the extremity and sides of which are two oval orifices by which the poison escapes. There are two secreting glands, each of which opens by an excretory duct to the exterior. Each gland is situated in a cavity, which it completely fills, and which is formed by the chitinous skeleton and by an enveloping layer, formed by striated muscular fibers; it is by the contraction of this latter that the poison is forced out. The gland has a central cavity which acts as a kind of reservoir, and a proper wall, which is formed by a layer of cells that send out prolongations into the cavity, and of a layer of epithelial cells, which, in the fresh condition, have a finely granulated protoplasm; these are the secreting cells. The poison is very active, and, even in weak doses, soon kills most animals, and especially arthropods or vertebrates. The phenomena of poisoning are always the same, and take place in the following order: (*a*) pain at the point of injury; (*b*) period of excitement; (*c*) period of paralysis. The conclusions which are characteristic of the second stage, are due to the action of the poison on the nervous centers, and especially on the brain; the paralytic phenomena are caused by the action of the poison on the peripheral extremities of the motor nerves, where they appear to have the same influence as curare. The muscles, the heart, and the blood are in no way attacked, and the poison may therefore be certainly placed among those which act on the nervous system. The scorpions found in France (*S. europæus*

and *S. occitanus*) cannot cause the death of a human subject, and are only dangerous when several poison a man at the same time, or attack very young children. To judge by his bibliography, the author is unacquainted with the observations on the habits of scorpions, published in 1882, by Prof. Lankester.—*Journ. R. Micr. Soc., August, 1884.*

OCCURRENCE OF TACHINA FLIES IN THE TRACHEÆ OF INSECTS.—N. Cholodkowsky gives in Zool. Anzeiger (June 9) an account of a young larval Tachina 1 ^{mm} long found in the ventral stigma of a carabus beetle. He afterward found the same kind and another species of Carabus infested with fully grown Tachina maggots. He also found a *Harpalus ruficornis* literally packed with these larvæ. The occurrence of Tachina larvæ in the bodies of grown-up insects is, he adds, no new thing. In 1828 Boheman found in *Harpalus ruficornus* and *aulicus* the larvæ of *Uromyia curvicauda;* Léon Dufour described *Hyalomyia dispar* as a parasite of *Brachyderus lusitanicus;* he also found the larva of Phasia in *Pentatoma grisea* and *Cassida viridis* and the larva of *Ocyptera bicolor* in *Pentatoma grisea.* Boye in 1838 took Tachinæ from three species of Carabus. Within a few years Künkel d' Herculais found the maggot of *Gymnosoma rotundatum* in the body of Pentatoma.

EATON'S MONOGRAPH OF RECENT EPHEMERIDÆ. Part II.—We have already (p. 630) called attention to this elaborate work. This part concludes the descriptions of the species as well as the nymphs when known. A most important feature of this part is the illustration of the nymphs, which have been drawn with great detail and engraved by A. T. Hollick, filling twenty large plates. Between this magnificent work and the elaborate memoir by Vayssière, as well as the papers of Joly, the Ephemerids certainly have no reason to complain; though their own lives scarcely span a day, their historians have devoted years of research to them.

STRUCTURE AND FUNCTION OF THE LEGS OF INSECTS.—We have already called attention to this essay by F. Dahl. The Journal of the Royal Microscopical Society for October contains an abstract of it, which our entomological readers will find of interest. The constancy of the number of six legs is probably to be explained as being in relation to the functions of the leg as climbing organs; one leg will almost always be perpendicular to the plane when the animal is moving up a vertical surface; and on the other hand we know that three is the smallest number with which stable equilibrium is possible; an insect must therefore have twice this number, and the great numerical superiority of the class may be associated with this mechanical advantage. This theory is not weakened, but rather supported, by the fact that the anterior pair of legs is rudimentary in many butterflies, for these are almost exclusively flying animals.

The author describes in some detail the arrangements of the muscles of the legs; the nerve-cord supplying them is pretty stout, and the large number of filaments sent to the joints of the tarsus lead to the supposition that these have a tactile function; the nerve-fibers are seen to enlarge into thick spindle-shaped ganglia. There are two tracheal trunks.

The prime function of the leg is locomotor, and insects move through gaseous, fluid and solid media. The last is seen in fossorial forms, of which Gryllotalpa may be taken as the type; here some of the joints are flattened out and provided with teeth, and the muscles are well developed.

In some cases, legs of a fossorial type are possessed by insects which move on the ground, but the larvæ of which are subterranean in habitat. The water-beetles and aquatic Rhynchota have the legs converted into swimming organs; they are widened out into plates, and provided at the sides with movable hairs, which are directed slightly backward. The median pair of legs in Corixa is provided with two very long hooks, the function of which is to fix the animal at some depth among the water-plants, and so to prevent its floating upwards.

In the aërial forms, we have first to notice those that move on the surface of the water; in these the legs are often provided with considerable enlargements of the tracheal trunk, by means of which they are enabled to float. Others have very long legs, by which they can balance themselves and extend over a large surface of the water; the lower surface of the tarsal joints, or that which is in contact with the water, is provided with thick hairs. In some Diptera hairy lobes are developed. Arrangements for climbing are very widely distributed, and are very various in character; the most common are hooks, which by their sharp tips are able to enter the smallest depressions, and so obtain a firm hold; sometimes they are pectinate and enabled to catch hold of fine hairs.

In very many cases there are organs of fixation; in the locust they have their chief mass made up of a large number of free flexible rods (not tubes). The periphery is occupied by scales which correspond in number to the rods, with which they appear to be connected by fibers; the space between the rods is filled with a fluid. Below these are groups of spindle-shaped cells which appear to be glandular in character. The fixing surface of the Hymenoptera, Neuroptera, and Lepidoptera consists of an impaired lobule placed between the hooks; their structure is most complicated in the first-named order. Observations on *Vespa crabro* did not result in the detection of any space which could be regarded as a vacuum. The lower surface of the lobule is soft and almost smooth; a few short hairs may be developed at its base; below this is a hard chitinous mass with stronger hairs. The upper surface is either covered with hairs or is finely folded. Near the base is a chitinous plate carrying a pair of strong setæ.

Within is an elastic bar, which is rolled up in a condition of repose; when extended it brings the lobule into contact with the surface on which the insect is standing. There are no well-developed gland-cells. After descriptions of other modes of fixation, the author gives the following table:

A. Organs of attachment at the end of the foot.	
α. Without fixing hairs	*Orthoptera.*
β. With fixing hairs	*Forficula.* *Coleoptera.* *Sialis.*
B. Organs of attachment between the hooks.	
α. A distinct median lobe.	
a. The median lobe with chitinous arches.	
1. Secondary in addition to the median lobe	*Neuroptera.*
2. No secondary lobes.	*Hymenoptera.*
b. No chitinous arches	*Lepidoptera.* *Tipula.*
β. No distinct median lobe.	
a. The lobes hairy	*Diptera.*
b. The lobes not hairy.	*Rhynchota.*

The legs may, further, have a sexual function as attaching or holding organs; or, as in *Mantis religiosa*, *Nepa cinerea*, etc., they may be of use in seizing prey; and, finally they may be used as cleansing organs. The legs in ants may be seen to be pectinate, an admirable arrangement for forms that live in dust and earth; they are often especially adapted for cleansing the proboscis and for other functions, for an account of which we must refer to the paper itself.

ENTOMOLOGICAL NOTES.—Dr. Brauer, says *Psyche* (Aug., Sept.) has noticed the transformations of a fly (*Hirmoneura obscura*) whose larva lives on that of the grub and pupa of the June beetle, *Rhizotrogus solstitialis.*——Mr. O. Lugger, according to *Science Record* has discovered a strange hymenopterous parasite infesting the larva of Tiphia, a black sand-wasp. The Tiphia lays its eggs in the larva of our June beetle (*Lachnosterna fusca*); the larva of Tiphia when nearly mature eats the white grub and then spins for itself a beautiful silken cocoon. This larva in turn is often infested by the larva of *Rhipiphorus pectinatus* or *R. limbatus*, the eggs of which have become fastened to the Tiphia, and in this way reach the Tiphia cocoon. Mr. Lugger has also found in the same cocoons small hymenopterous parasites.——Interesting cases of lack of symmetry among insects are described in *Psyche* by O. P. Krancher.——Mr. P. Cameron states in the *Entomologist's Monthly Magazine* for October that since the publication of the first volume of his Monograph of British Phytophagous Hymenoptera, wherein he gave an account of what was known up to that time of the occurrence of parthenogenesis in sand-flies, he has been able to prove experimentally its existence in thirteen additional species, including *Lophyrus pini*, of which males were bred.——The second number of Vol. XI, of the Transactions of

the American Entomological Society contains a synopsis of North American Trichopterygidæ, by Rev. A. Matthews, of England. He regards this as the most extensive family of the whole order of Coleoptera. Dr. Horn notices the species of Anomala of the U. S. and gives a synopsis of the U. S. species of Notoxus and Mecynotarsus, while pp. 177 to 244 are devoted to a synopsis of the Philonthi of boreal America.——Among the papers of value to American students in parts 1–3 of the Transactions of the Entomological Society of London, are Elwes' additional notes on the genus Colias; E. B. Poulton's notes upon or suggested by the colors, markings, and protective attitudes of certain lepidopterous larvæ and pupæ, etc.; Lord Walsingham's North American Tortricidæ; E. Saunder's notes on the terminal segments of aculeate Hymenoptera, and Forsayeth's life-histories of sixty species of Lepidoptera of Central India.——The Transactions of the Imperial Zoölogical-botanical Society of Vienna, for 1884, are rich in valuable entomological papers. Dr. R. Latzel describes (p. 127) two new species of Eurypauropus, myriopods of the order Pauropoda, from Austria, showing that this genus is common to North America and Europe.——In the same volume von Wattenwyl, under the title "Ueber hypertalische nachahmungen bei den Orthoptera," notices and illustrates two cases of mimicry of dead colored leaves by a Phaneropterid grasshopper. The second form is wingless and strikingly resembles a worker ant. It is named *Myrmecophana fallax*.——The fourth part of the Transactions of the Entomological Society of London contains, among other papers two of much general interest by Baron Osten Sacken, *i. e.*, facts concerning the importation or non-importation of Diptera into distant countries, and an essay on comparative chætotaxy, or the arrangement of characteristic bristles of Diptera.——A carefully prepared and very just tribute to the memory of our greatest entomologist, Dr. John L. LeConte, by S. H. Scudder, appears in advance from the Transactions of the American Entomological Society.——We have received a well illustrated report on the tea-mite and the tea-bug of Assam, by J. Wood-Mason, of Calcutta; the mite puncturing the leaves so that "a badly smitten garden may be recognized from a distance by its red color," and the bug also blighting the leaves. It appears that of the two species of tea plant cultivated in Assam the indigenous species which affords the strong and rasping liquor, when pure, enjoys an almost complete immunity from attack, while the milder juices of the imported Chinese bush render it liable to attack. Mr. Mason then asks how the bugs distinguish between different but closely similar plants, infallibly selecting the right food-plants for their larvæ.——At a meeting of the London Entomological Society held July 2, Dr. Sharp remarked that *Cybister ræseli* has been kept alive from five to seven years by being fed on earthworms once or twice a day.——Dr. Witlaczil has published in

the Transactions of the Vienna Academy of Science an essay on the polymorphism of an Aphis (*Chætophorus populi*).——A new cave-spider, says *Science-Gossip* for December, has been found in a cave in Tasmania, the female of which measures six and a half inches from tip to tip of the fore and hind legs.——Sharp has detected on the prothoracic stigma of the beetle (Chalcolepidius) trap-door-like lobes closing them so as to prevent the entrance of small mites (Proc. Ent. Soc. London, p. iii).

ZOÖLOGY.

THE DEEP-SEA EXPLORATIONS OF THE "TALISMAN" (*continued*).—The Sargasso sea was then visited, and deep-sea soundings made to ascertain the nature of the bed of that part of the ocean. From Cape Verde, the ocean gradually deepens toward the 25th parallel, when it attains a depth of 6267 meters; but it gradually rises toward the Azores, and, under the 35th parallel, it is not over 3175 meters deep. These results are far from being in accord with the indications on the charts of the Atlantic ocean recently published, where the curves of depth give very considerable inequalities.

Whenever soundings were made, specimens of a very fine ooze, formed of fine particles of pumice, mixed with globigerina, were brought up. This ooze, at first reddish near the Cape Verde islands, afterward became of an almost pure white. Each time the dredge furrowed the face of the sea bottom, it was more or less filled with fragments of pumice stonea nd of volcanic rocks. It would seem as if there were, more than a league under the sea, a great chain of volcanoes parallel to the African coast, and of which the Cape Verde islands, the Madeiras, the Canaries and the Azores were the only points of emergence.

The submarine fauna there is scanty. To the stones were attached brachiopods (*Discina atlantica*). A blind Fusus (*Fusus abyssorum*), and a new genus of Lamellibranchs (*Pygotheca fragilis*), as well as several Pleurotoma, occurred. Some Crustacea, such as hermit crabs (*Pagurus pilimanus*), which lodge in colonies of Epizoanthus, and which have already been dredged on the African coast, some amphipods of the genus Nematocarcinus, Holothurians of the group of Elpidia, of which one species was new, Asterians, Ophiurans, and rare corals, scarcely indemnified the party for the time given to dredging at such great depths.

It was only toward the north limits of the Sargasso sea, near the Azores, where the depths are 3000, 2500 and 1400 meters, that our collections became abundant. The 11th of August, at 2500 to 2900 meters, the *Talisman* party captured the giant of the family of Schizopodes—a Gnathophausia, of a blood-red, measuring almost 0.25 millimeters in length, and meriting well the specific name of Goliath, which has been applied to it. In